Condition Based Maintenance Plus (CBM+) Overview

Greg Kilchenstein

Office of the Deputy Assistant Secretary of Defense for Maintenance

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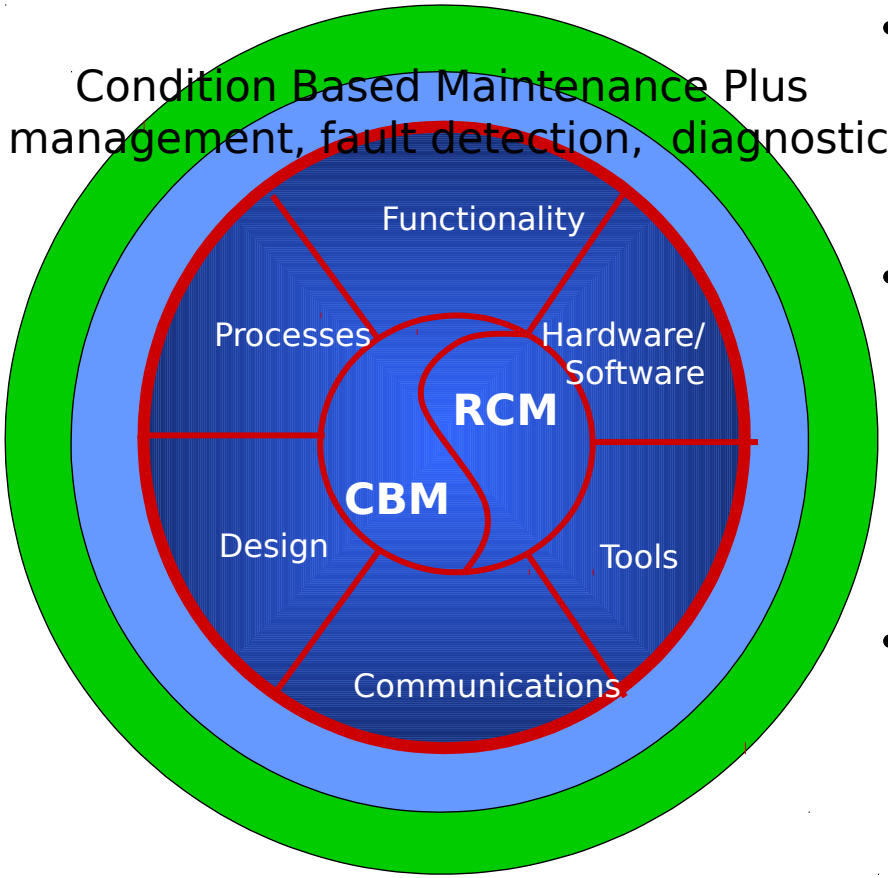
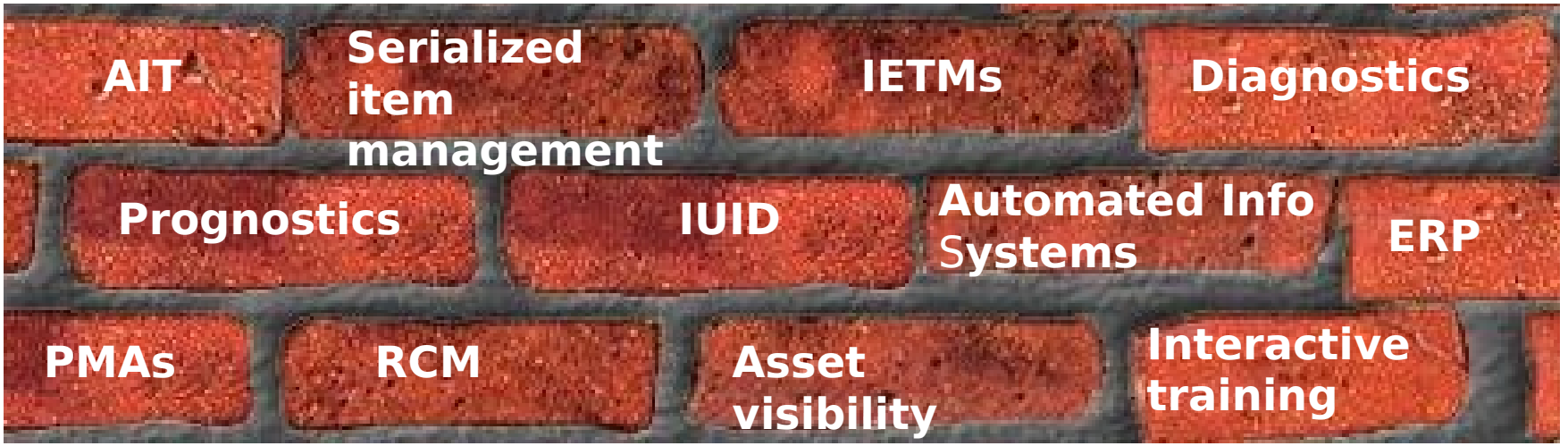
CBM+ Overview



- CBM+ initiative envisions an integrated set of capabilities, technologies, and business processes
- As Service Plans evolve and CBM+ efforts are implemented, OSD supports the development of technology, processes, tools, and procedures to enable maintenance improvements
- CBM+ Goal – proactive maintenance based on evidence of need performed at an optimal time by maintainers with the
  - right knowledge,
  - right tools, and
  - right support

CBM+ Enablers

- CBM+ implements…*practices, techniques and technologies* that improve maintenance capabilities and execution



- Interoperable, open architecture is critical for desired effect

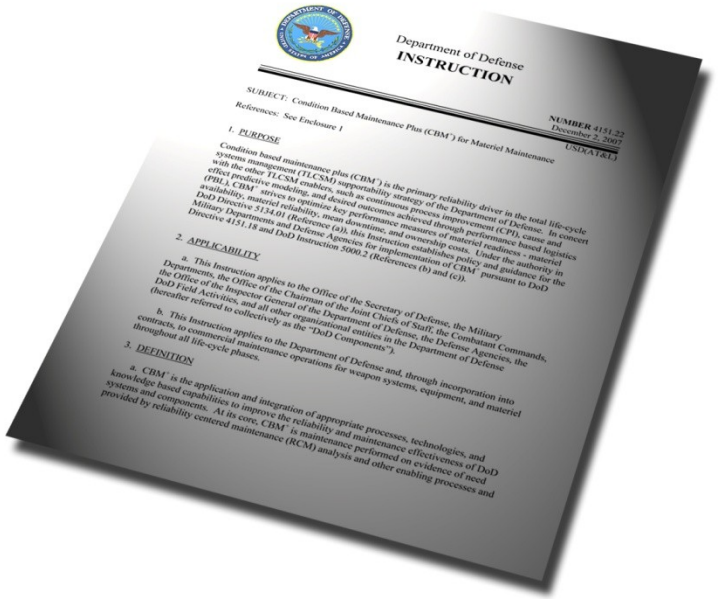
CBM+ Policy

DoDI 4151.22 – Condition Based Maintenance Plus (CBM+) for Materiel Maintenance (December 2007)

CBM+ is the application and integration of appropriate processes, technologies, and knowledge-based capabilities to improve the reliability and maintenance effectiveness of DoD systems and components.

CBM+ is

- Applied to both new design and current fielded systems
- Achieved with enabling technologies, tools, and processes from public and private sources
- Incorporated in organic capabilities and commercial contracts
- Funded from design through implementation to achieve warfighter outcomes
- Measured with key performance indicators – materiel availability and reliability, mean



Department of Defense
INSTRUCTION

NUMBER 4151.22
December 2, 2007
USD(AT&L)

SUBJECT: Condition Based Maintenance Plus (CBM+) for Materiel Maintenance

References: See Enclosure 1

1. PURPOSE

Condition based maintenance plus (CBM+) is the primary reliability driver in the total life-cycle systems management (TLCSM) supportability strategy of the Department of Defense. In concert with the other TLCSM enablers, such as continuous process improvement (CPI), cause and effect predictive modeling, and desired outcomes key performance achieved through performance based logistics (PBL), CBM+ strives to optimize materiel readiness – materiel availability, materiel reliability, mean downtime, and ownership costs. Under the authority in DoD Directive 5134.01 (Reference (a)), this Instruction establishes policy and guidance for the Military Departments and Defense Agencies for implementation of CBM+ pursuant to DoD Directive 4151.18 and DoD Instruction 5000.2 (References (b) and (c)).

2. APPLICABILITY

a. This Instruction applies to the Office of the Secretary of Defense, the Military Departments, the Office of the Chairman of the Joint Chiefs of Staff, the Combatant Commands, the Office of the Inspector General of the Department of Defense, the Defense Agencies, the DoD Field Activities, and all other organizational entities in the Department of Defense (hereafter referred to collectively as the "DoD Components").

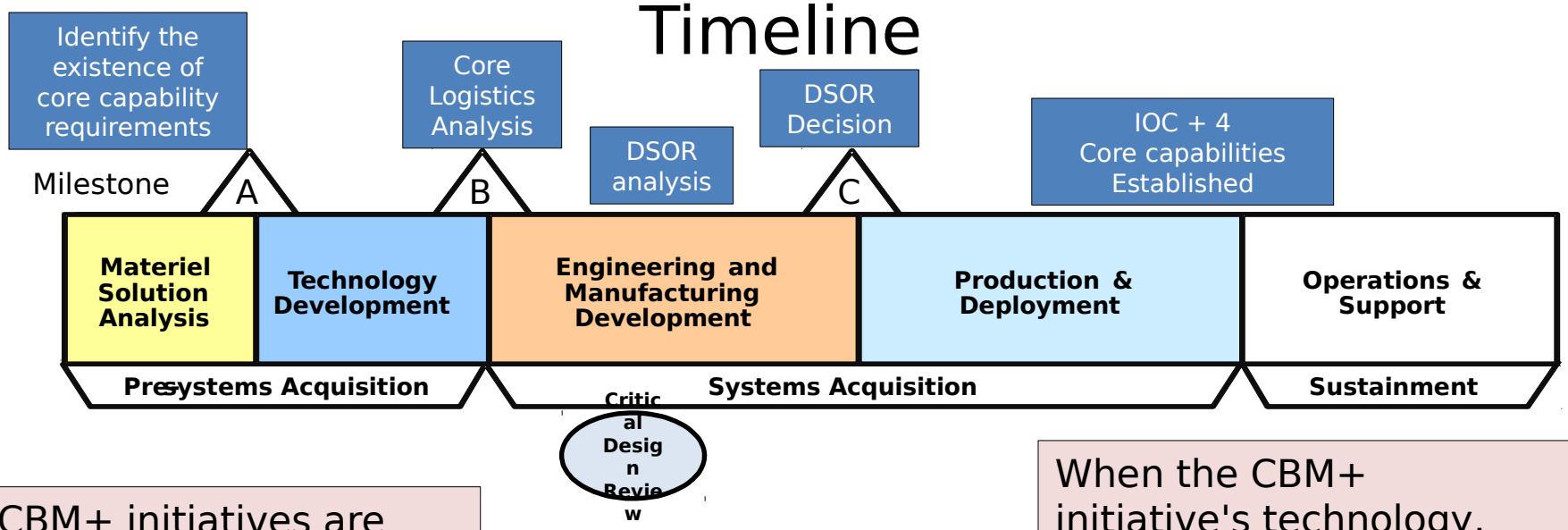
b. This Instruction applies to the Department of Defense and, through incorporation into contracts, to commercial maintenance operations for weapon systems, equipment, and materiel throughout all life-cycle phases.

3. DEFINITION

a. CBM+ is the application and integration of appropriate processes, technologies, and knowledge based capabilities to improve the reliability and maintenance effectiveness of DoD systems and components. At its core, CBM+ is maintenance performed on evidence of need provided by reliability centered maintenance (RCM) analysis and other enabling processes and

Total System Life Cycle Support Planning

Key Maintenance Points on Acquisition Timeline



CBM+ initiatives are most effective when started early in the system/component's life cycle to ensure program support and proper resources. Phase for RCM and BCA activities

The CBM+ implementation team follows planned phased milestones and tests that will demonstrate the initiative's effectiveness, interoperability, and

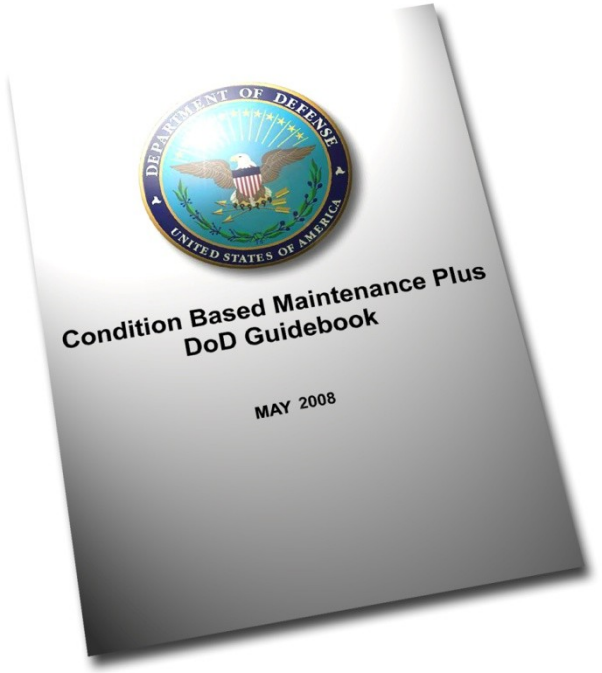
When the CBM+ initiative's technology, tool, process, or procedure reaches the operational user, continuous revalidation of performance and review of expectations will indicate any required adjustments or refresh

On-Going CBM+ Activity

- OSD Action Group
  - Service headquarters representation with Systems Commands assistance
  - Bi-monthly sessions to share information on projects, technologies, and capabilities – available on line
- Working IPTs
  - RCM – DoD 4151.22M, CLL030, brochure
  - Policy – as required to insert CBM+ in OSD directives and guidance
- Other activities
  - NDIA – EHM committee from private sector companies
  - SAE – CBM process flow study being initiated

OSD CBM+ Guidance

- DoD Guidebook (May 2008)
  - Ready reference for CBM+ project development, implementation, ar execution
  - 2010BCA Study - a supplement tc the Guidebook



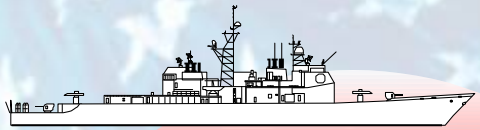
- Communication & Outreach
  - DAU CLM (CLL029) – on line today
  - DAU LOG 101 and 201 inputs
  - DAG Chapter 5 inputs
  - DoD Maintenance Symposium breakouts & exhibits
  - Supportability Guide inputs
  - Website @ http://www.acq.osd.mil/log/mpp/cbm+.html

Service CBM+ Policy & Guidance

Army	Air Force
➢AR 750-01, *Army Materiel Maintenance Policy*, 20 Sep 2007 ➢*U.S. Army CBM+ Roadmap*, Dec 13, 2007 ➢ASA ALT Memo, *CBM+*, 20 Mar 2008 ➢AR 700-127, *Integrated Logistics Support*, 29 Apr 2009 ➢Draft *CBM+ Implementation Plan* (G-4/LIA)	➢AFI 63-101, *Acquisition and Sustainment Life Cycle Management*, 8 Apr 2009 ➢AFPAM 63-128, *Guide to Acquisition and Sustainment Life Cycle Management* , 5 Oct 2009 ➢AFMCI 63-1201, *Implementing Operational Safety Suitability and Effectiveness & Life Cycle Systems Engineering*, 11 Feb 2011
Navy	**Marine Corps**
➢OPNAV Instruction 4790.16, *Condition Based Maintenance (CBM) Policy*, 17Dec 2007 (being revised) ➢NAVSEAINST 4790.27, *RCM and CBM Policy for Ships, Ship Systems, and Equipment*, 16 Sep 2009 ➢NAVAIRINST 4790.22B, *Design Interface and Maintenance Planning*, 27 Jun 2011	➢MCO 4000.57, *Marine Corps Total Life Cycle Management*, 16 Sep 2005 – CBM+ roles for I&L, LOGCOM & SYSCOM ➢Draft Marine Corps Order 4700 series (new - combines CBM+ and RCM policy)

Transform DoD Maintenance

Enabled by CBM+



Embedded Sensors

Integrated Data Bus

Maintenance

On-Board Diagnostics and Prognostics

Sense & Respond Logistic

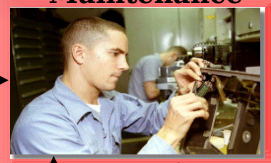
Anticipatory Materiel

Reduced Footprints

Preventive Maintenance

Integrated Logistics Information

Maintenance



CBM+

Interactive Training & Tech Support

Data Transfer

Pedigree Management

Troubleshooting and Repair

Predictive Maintenance

RCM Data Analysis

Portable Maintenance Aids

IUID/SIM Data Bases

Condition Monitoring

Reliability Analysis

Linked to Warfighters

Battlespace Network

Maintenance History

Configuration Control

Total Asset Visibility (RFID)

- **Real-time Status of Equipment Material Condition**
- **Integrated Supply/Maintenance via Serialized Item Management**
- **Total Asset Visibility**

CBM+ Outcomes

Digital Source Collectors

Engine Nose Gearboxes, Main Transmission and Accessory Clutches
Main Rotor Swashplate
APU and Clutch
Tail Rotor Gear Box and Tail Rotor Swashplate
Advanced Rotor Smoothing/Diagnostics
Engines
Modernized Signal Processing Unit (MSPU)
Forward/Aft Hangar Bearings
Intermediate Gearbox

Apache CBM+ effort
Today — Demonstrating 2-way data interchange from platform on the ground to the CBM Data Warehouse
Tomorrow — Perform in-flight data transmission to the flight line

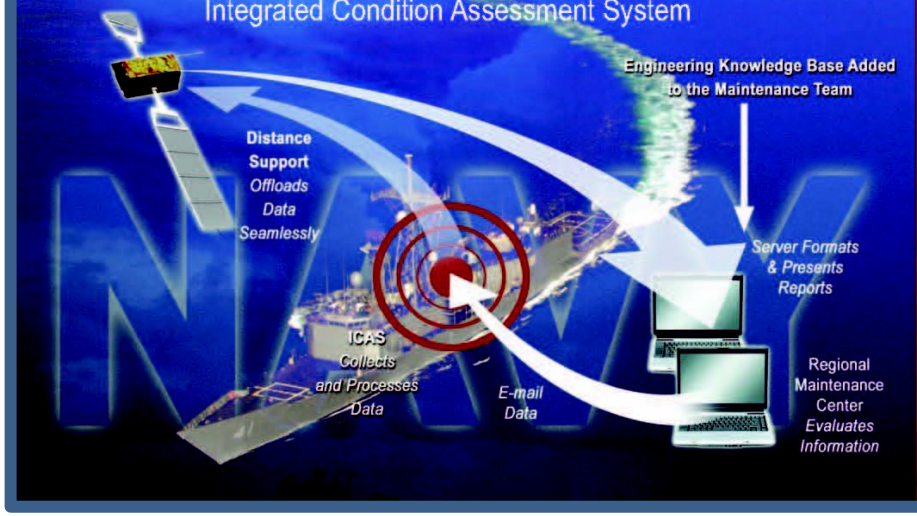
Air Force CBM+ empowers the systems experts to make knowledge-based decisions that increase system availability and decrease cost

New Acquisitions:
C-17 CBM+ Pilot Program
JSF Prognostic Health Management
F-22 Integrity Data and Reporting System (IDARS)

Legacy Systems:
C-130 Automated Inspection, Repair, Corrosion and Aircraft Tracking (AIRCAT)
C-5 Aging Fleet Integrity Management (AFIRM)
Engine Health Management Plus (EHM+)

Programs:
C-5 MSG-3
C-130 and B-1 HVM Programs
Collective Mind Predictive Trending
CBM+ Research Environment and Web Services
Systems Lifecycle Integrity Management (SLIM) AFIT Educational Course

Integrated Condition Assessment System


Engineering Knowledge Base Added to the Maintenance Team
Distance Support Offloads Data Seamlessly
Server Formats & Presents Reports
ICAS Collects and Processes Data
E-mail Data
Regional Maintenance Center Evaluates Information

Technologies and processes that improve the maintenance decisions and integrate logistics

NET Centric Integrated Logistics
Joint Intelligence/Integration
Command and Control

Organized
Optimized
Modernized
Postured

Global Information Grid

Vision & Strategy 2025

Reliability Centered Maintenance

Sense & Respond Logistics

Anticipatory Logistics
Enterprise Health Management
Failure Management Strategies
Reliability Availability Maintainability

Autonomic Logistics Services
Combat Power Assessment
Embedded Platform Logistics Systems